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ABSTRACT

The United States Training and Employment Service General Aptitude Test Battery (GATB), first published in 1947, has been included in a continuing program of research to validate the tests against success in many different occupations. The GATB consists of 12 tests which measure nine aptitudes: General Learning Ability; Verbal Aptitude; Numerical Aptitude; Spatial Aptitude; Form Perception; Clerical Perception; Motor Coordination; Finger Dexterity; and Manual Dexterity. The aptitude scores are standard scores with 100 as the average for the general working population, and a standard deviation of 20. Occupational norms are established in terms of minimum qualifying scores for each of the significant aptitude measures which, when combined, predict job performance. Cutting scores are set only for those aptitudes which aid in predicting the performance of the job duties of the experimental sample. The GATB norms described are appropriate only for jobs with content similar to that shown in the job description presented in this report. A description of the validation sample is also included.

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TECHNICAL REPORT

ON

STANDARDIZATION OF THE GENERAL APTITUDE TEST BATTERY

FOR

CEMENTER, HAND (boot and shoe) II 6-61.311

B-411

or

S-147

U. S. Employment Service in
Cooperation with
Florida State Employment Service

U. S. DEPARTMENT OF LABOR
Bureau of Employment Security
Washington 25, D. C.
January 1959

GATB #2211
March 1958

STANDARDIZATION OF THE GENERAL APTITUDE TEST BATTERY
FOR
CEMENTER, HAND II 6-61.311

B-411 or S-147

Summary

The General Aptitude Test Battery, B-1002A, was administered to a sample of 54 female applicants who were subsequently employed as Cementer, Hand II 6-61.311 at Telectron, Incorporated, Ft. Lauderdale, Florida. The criterion consisted of supervisory ratings made on a descriptive rating scale. On the basis of mean scores, job analysis data, and their combined selective efficiency, Aptitudes K-Motor Coordination, F-Finger Dexterity, and M-Manual Dexterity were selected for inclusion in the test norms.

GATB Norms for Cementer, Hand II 6-61.311 - B-411 or S-147

Table I shows, for B-1001 and B-1002, the minimum acceptable score for each aptitude included in the test norms for Cementer, Hand II 6-61.311.

TABLE I

Minimum Acceptable Scores on B-1001 and B-1002 for B-411 or S-147

B-1001			B-1002		
Aptitude	Tests	Minimum Acceptable Aptitude Score	Aptitude	Tests	Minimum Acceptable Aptitude Score
T	CB-1-G CB-1-K	75	K	Part 8	80
F	CB-1-O CB-1-P	90	F	Part 11 Part 12	85
M	CB-1-M CB-1-N	90	M	Part 9 Part 10	85

Effectiveness of Norms

The data in Table IV indicate that 11 of the 18 poor workers, or 61 percent of them, did not achieve the minimum scores established as cutting scores on the recommended test norms. This shows that 61 percent of the poor workers would not have been hired if the recommended test norms had been used in the selection process. Moreover, 29 of the 36 workers who made qualifying test scores, or 81 percent, were good workers.

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TECHNICAL REPORT

I. Problem

This study was conducted to determine the best combination of aptitudes and minimum scores to be used as norms on the General Aptitude Test Battery for the occupation of Cementer, Hand II 6-61.311.

II. Sample

The General Aptitude Test Battery, B-1002A, was administered during the month of March 1958 to 54 female applicants who were subsequently employed as Cementer, Hand II 6-61.311 at Telechtron, Incorporated, Ft. Lauderdale, Florida.

There was no age requirement for this job. The company preferred applicants with at least an eighth grade education. Experience was not required since this is a new job in this area. The plant superintendent and others evaluating the job agreed that the amount of training required on the job was less than a week, therefore, all employees who had worked one week or more were used in the experimental sample.

Table II shows the means, standard deviations, ranges, and Pearson product-moment correlations with the criterion for age, education, and experience.

TABLE II

Means (\bar{X}), Standard Deviations (σ), Ranges, and Pearson Product-Moment Correlations with the Criterion (r) for Age, Education, and Experience

Cementer, Hand II 6-61.311
N = 54

	M	σ	Range	r
Age (years)	36.2	8.3	18-56	-.093
Education (years)	10.5	1.6	7-16	.042
Experience (months)	--	---	---	---

The data in Table II indicate that there are no significant correlations between age or education and the criterion. The data indicate that the sample is suitable for test development purposes with respect to age and education. No statistics were obtained for experience, since all the employees used in the sample had worked the same length of time.

III. Job Description

Job Title: Cementer, Hand 6-61.311

Job Summary: Assembles shoes by hand by cementing various parts to pre-cast composition sole. Applies glitter-like material to heel of shoe for decorative purpose; fastens toe and heel straps to shoe; fastens decorative insole to sole of shoe; and inspects finished shoes.

Work Performed: Applies glitter-like material to heel of shoe for decorative purposes: Inserts pick in hollow portion of heel by hand to hold heel for subsequent operation. Applies lacquer as an adhesive to outside surface of heel by hand with small brush. Applies glitter-like material to wet lacquered surface of heel by holding under hose of glitter machine emitting glitter for decorative purpose.

Fastens toe and heel straps to shoe: Applies rubber cement on toe and heel of shoe by hand using a small brush. Selects and places ends of finished straps on cemented area to bond both toe and heel straps to sole of shoe.

Fastens decorative insole to sole of shoe: Places pre-cut insole between rollers of glue machine with right hand to apply cement on bottom surface. Takes insole from glue machine with left hand and fits to surface of sole by pressing with cloth to fasten insole to shoe and cover ends of toe and ankle straps.

Inspects finished shoes by observation for defective workmanship prior to packaging for shipment.

IV. Experimental Battery

All the tests of the GATB, B-1002A, were administered to the sample group.

V. Criterion

The criterion consisted of supervisory ratings based on the Descriptive Rating Scale developed by the Bureau of Employment Security, Form SP-21. More objective criteria were not available as production lines were not operating at full speed because of the training of new employees in the plant. The criterion data were collected four to five weeks after the workers were on the job.

Only one rating was obtained from the supervisor as he was pressed for time in the opening of this new plant and felt his ratings would not change. There were no other line supervisors who had worked long enough to validly rate these employees.

VI. Statistical and Qualitative Analyses

A. Statistical Analysis:

Table III shows the means, standard deviations, and Pearson product-moment correlations with the criterion for the aptitudes of the GATB. The means and standard deviations of the aptitudes are comparable to general working population norms with a mean of 100 and a standard deviation of 20.

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TABLE III

Means (\bar{X}), Standard Deviations (σ), and Pearson Product-Moment Correlations with the Criterion (r) for the Aptitudes of the GATB

Cementer, Hand-6-61.311
N = 54

Aptitudes	\bar{X}	σ	r
G-Intelligence	88.4	13.0	.217
V-Verbal Aptitude	95.6	13.9	.073
N-Numerical Aptitude	85.9	15.4	.203
S-Spatial Aptitude	85.4	11.6	.228
P-Form Perception	86.8	15.3	.076
Q-Clerical Perception	93.5	14.6	.140
K-Motor Coordination	100.5 [#]	16.8	.174
F-Finger Dexterity	98.8 [#]	20.1	.268*
M-Manual Dexterity	102.9 [#]	19.0	.215

* Significant at the .05 level

[#] Relatively high mean score

The highest mean scores in descending order of magnitude were obtained for Aptitudes M, K, and F. All the aptitudes, except Aptitude F have standard deviations of less than 20. Aptitude S has the lowest standard deviation.

B. Qualitative Analysis:

The statistical results were interpreted in the light of the job analysis data. The job analysis indicated that the following aptitudes measured by the GATB appear to be important for this occupation.

Intelligence (G) - required in using initiative and in making judgments to obtain desired quality in the finished shoe.

Form Perception (P) - required in lining straps and soles correctly to make desired sizes in shoes and in observing shoes for defective workmanship.

Motor Coordination (K), Finger Dexterity (F), and Manual Dexterity (M) - required in assembling shoes by hand; in making gross movements such as applying lacquers and glue to shoes; in fitting insoles to soles of shoes; and in placing straps on shoe.

C. Selection of Test Norms:

Based on the quantitative and qualitative evidence cited above, Aptitudes K, F, and M warranted further consideration for inclusion in the test norms. The evidence for each of these aptitudes is indicated below.

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<u>Aptitude</u>	<u>Relatively High Mean Score</u>	<u>Significant Correlation with the Criterion</u>	<u>Importance Indicated by Qualitative Analysis</u>
K	X		X
F	X	X	X
M	X		X

Although Aptitude V showed a high mean score and Aptitude P appeared to be important on the basis of job analysis data, these aptitudes were not considered further for inclusion in the norms because there was no other qualitative or quantitative evidence of significance.

Various combinations of Aptitudes K, F, and M, with appropriate cutting scores were selected as trial norms. The relationship between each set of trial norms and the criterion (dichotomized as indicated in section VII) was determined.

A comparison of the results showed that norms consisting of K-80, F-85, and M-85 for B-1002 and equivalent norms of T-75, F-90, and M-90 for B-1001 had the best selective efficiency.

In test development studies an attempt is made to develop a set of norms such that the cutting score for each aptitude included in the norms will be set at a five-point score level close to one standard deviation below the aptitude mean of the experimental sample. Adjustments of cutting scores from one standard deviation below the mean are made to effect better selective efficiency of the norms. In this study the aptitude cutting scores are each within 10 points of one standard deviation below the aptitude mean of the sample.

VII. Predictive Validity of Norms

For the purpose of computing the tetrachoric correlation coefficient between the test norms and the criterion and applying the Chi Square test, the criterion was dichotomized by placing one-third of the sample in the low criterion group. This was accomplished by using a descriptive rating scale score of 19 as the criterion critical score and resulted in 18 of the 54 workers, or 33 percent of the sample, being placed in the low criterion group.

Table IV shows the relationship between test norms consisting of Aptitudes K, F, and M with critical scores of 80, 85, and 85, respectively, and the dichotomized criterion for Cementer, Hand II 6-61.311. Workers in the high criterion group have been designated as "good workers" and those in the low criterion group as "poor workers."

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TABLE IV

Relationship between Test Norms Consisting of Aptitudes K, F, and M with Critical Scores of 80, 85, and 85, Respectively, and the Criterion for Cementer, Hand II 6-61.311

N = 54

	Non-Qualifying Test Scores	Qualifying Test Scores	Total
Good Workers	7	29	36
Poor Workers	11	7	18
Total	18	36	54

$$r_{tet} = .63$$

$$\chi^2 = 7.594$$

$$\sigma_{r_{tet}} = .23$$

$$P/2 < .005$$

The data in the above table indicate a significant relationship between the test norms and the criterion for the sample.

VIII. Conclusions

On the basis of mean scores, correlations with the criterion, job analysis data, and their combined selective efficiency, Aptitudes K, F, and M with minimum scores of 80, 85, and 85, respectively, are recommended as B-1002 norms for the occupation of Cementer, Hand II 6-61.311. The equivalent B-1001 norms consist of T-75, F-90, and M-90.

IX. Determination of Occupational Aptitude Pattern

When the specific test norms for an occupation include three aptitudes, only those occupational aptitude patterns which include the same three aptitudes with cutting scores that are within 10 points of the cutting scores established for the specific norms are considered for that occupation. The only one of the existing 23 occupational aptitude patterns which meets these criteria for this study is OAP-17 which consists of K-85, F-80, and M-80 for B-1002 and T-80, F-85, and M-85 for B-1001. The selective efficiency of OAP-17 for this sample was determined by means of the tetrachoric correlation technique. A tetrachoric correlation of .48 with a standard error of .23 was obtained, which indicates a significant relationship between OAP-17 and the criterion for this experimental sample. The proportion of the sample screened out by OAP-17 was .35, which is within the required range of .10 to .60. Therefore, it is recommended that OAP-17 be used in counseling for the occupation of Cementer, Hand II 6-61.311.